Results of Rapid Identification of Gram-Positive Bacteria combined with Rapid Pharmacy Notification and Treatment in a Community Hospital Healthcare System

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Background

Rapid diagnostics for bloodstream infections have been shown to improve patient outcomes such as length of stay (LOS), patient cost, pharmacy cost, and mortality. We used the Nanosphere (Northbrook, IL) Verigene Gram Positive Blood Culture Test (BC-GP) combined with rapid notification of Pharmacy staff to evaluate the effect on time to definitive treatment, reduction of treatment for contaminants, and impact on selected outcomes in our sepsis patient population.

Methods

BC-GP was performed 24 hours per day, 7 days a week and results were called to Pharmacy within 4 hours of bottle positivity (See Figure 1). This required careful monitoring and reporting to staff weekly. All positive results were cultured and identified using traditional biochemical culture methods (See Figure 2). The laboratory personnel called directly to the Pharmacist and they, in turn, directly notified physicians and assisted with antibiotic therapy using an algorithm developed with our Infectious Disease staff. The primary outcomes were average time to definitive antibiotic therapy and reduction or elimination of antibiotic therapy for probable contaminants. Secondary outcomes were hospital LOS, mortality, pharmacy cost, and overall hospitalization costs. Patients with a Gram-positive bacteremia (GP-BSI) admitted in 2012 and 2013 (pre-rapid testing) were compared with those admitted in 2014 (post-rapid testing) for LOS, cost, and mortality. Other data that was examined during the year was compliance or de-escalation of therapy which occurred in the year. For our sepsis population we did not see any significant difference in cost of stay, LOS, or mortality; however, we tested 237 of 1,204 sepsis coded patients not treated with antibiotics unnecessarily and earlier intervention with more appropriate therapy. Other recommendations were followed 100 percent of the time with the exception of de-escalation of therapy which found compliance at only 68 percent. Toward the end of the study compliance was again assessed by reviewing random cases and it was found that there was no significant change in compliance or de-escalation however, physician staff expressed more confidence with the results as time progressed. Most clinical staff were more willing to follow suggested algorithm when supported with direct interactions with our Pharmacy staff in all cases reviewed in the year. For our sepsis population we did not see any significant difference in cost of stay, LOS, or mortality; however, we tested 237 of 1,204 sepsis coded patients and 967 had negative blood cultures, no blood culture patients regardless of coding for the year of implementation (2014) compared to previous years (2012, 2013).

Results

1,026 patients had GP-BSI; of which 237 were coded as sepsis. The other 789 were coded with other medical conditions that included bacteremia. BC-GP combined with our treatment algorithm, improved mean time to targeted antibiotic therapy (77.5 vs 28.9 hrs, p<0.001) and decreased antibiotic therapy for 384 patients with positive blood cultures that were probable contaminants, which rests, in a reduction of 50:59 hrs for definitive treatment and an estimated reduced pharmacy cost of $115k. Total year end savings to our pharmacy was ~$220k. Pharmacy staff surveyed physicians initially for compliance with the algorithm and found that physicians followed no treatment for possible contaminants in all cases when it was a single bottle culture, or Gram-negative infections. Other recommendations were followed 100 percent of the time with the exception of de-escalation of therapy which found compliance at only 68 percent. Toward the end of the study compliance was again assessed by reviewing random cases and it was found that there was no significant change in compliance or de-escalation however, physician staff expressed more confidence with the results as time progressed. Most clinical staff were more willing to follow suggested algorithm when supported with direct interactions with our Pharmacy staff in all cases reviewed in the year. For our sepsis population we did not see any significant difference in cost of stay, LOS, or mortality; however, we tested 237 of 1,204 sepsis coded patients and 967 had negative blood cultures, no blood culture patients regardless of coding for the year of implementation (2014) compared to previous years (2012, 2013). We compared rapid blood ID intervention results to all the positive blood cultures for 2012-13; the average LOS was reduced in our intervention group to 10.5 d compared to 15.5 (2013) and 17.2 (2012) (2013 and 2012). This has been attributed to earlier discharge for patients not treated with antibiotics unnecessarily and earlier intervention with more appropriate therapy.

Conclusions

Rapid identification of GP-BSI with AST intervention decreased time to appropriate therapy and reduced unnecessary therapy for positive blood cultures that were considered to be contaminants. While other outcomes did not show an impact, overall cost savings for Pharmacy and more appropriate antibiotic use clearly show the value of earlier identification of bloodborne pathogens.

Figure 1. Time to ID average and time owned compared to identification and AST completed using traditional microbiological culture and ID system.

Figure 2. Rapid ID on the Verigene compared to traditional Microbiology techniques and potential impact on time to definitive therapy. Pharmacist notified and worked directly with physician on treatment for each patient. Average time from blood culture draw to intervention was 28.9 hours compared to 77.5 hours for traditional culture (data not shown).

Figure 3. Numbers of sepsis coded patients for the year of implementation of rapid blood culture ID and intervention. Adding the BG GN panel in the future may result in more impact to this patient population.

Figure 4. Comparison of the overall LOS for the entire population of positive blood culture patients regardless of coding for the year of implementation (2014) compared to previous years (2012, 2013).